REMARKS

The Final Rejection having been withdrawn and prosecution at the examiner's level having been reopened after the filing of appellant's Brief on February 27, 2003, a new Office Action was mailed May 16, 2003, and applicant has studied same along with the newly applied prior art. The claims in the application remain as claims 18-23 and 30-33. These claims define patentable subject matter and should be allowed. Accordingly, applicant again respectfully requests favorable reconsideration and allowance.

The examiner is thanked for helpfully pointing out the informality in claim 20. This informality has now been corrected to place the application in better form consistent with U.S. practice. This is a cosmetic and non-narrowing amendment; no limitations have been added and none are intended.

Withdrawal of the rejection is respectfully requested.

An amendment has been introduced into the preamble of main claim 18 to make explicit what applicant has consistently argued, and what applicant believes was at least implicit in the previous claim form from the word "filter".

Claims 18-23 and 30-33 have been rejected as obvious under §103 from previously applied Wiegand in view of newly applied unexamined German application DT 23 58 808, owned by Hoechst, inventors Holst et al (hereinafter simply "Holst"), an English language translation being attached herewith. This rejection is respectfully traversed.

The new rejection replaces the previous and now withdrawn rejection by the replacement of Novak with Holst. Nevertheless, many of the points raised in previously filed Replies and in appellant's Brief of February 27, 2003, still apply. To avoid prolixity, applicant simply and respectfully repeats by reference the arguments appearing in the Brief which relate to the fact that the prior art does not disclose or deal with a filter, which is after all what applicant is claiming.

Applicant respectfully requests the examiner to again consider those points raised in appellant's Brief of February 27, 2003, bearing in mind that neither Wiegand nor Holst disclose or relate to a filter. Where neither reference discloses a filter, it is clear that their combination (even if such combination were obvious, not conceded by applicant) could not result in a filter.

Now moving on, Wiegand has been thoroughly discussed previously, and applicant's previous remarks concerning

Wiegand are also respectfully repeated by reference; and the examiner is respectfully requested to review appellant's Brief of February 27, 2003, in this regard.

With reference to said Brief, applicant wishes at this time to focus on the text commencing at about the middle of page 14. In this regard, neither Wiegand nor Holst relates to a filter. Applicant's main claim 18 calls for a

> filter material comprising a sheet-like matrix....

The rejection states that the Wiegand oil sorbent mat is a filter (which it is not) and comprises a non-woven sheet-like matrix, with reference to column 2, line 13 of Wiegand. But this is not accurate. Applicant agrees that the mat-like structure is one embodiment of what the Wiegand sorbent material is. But it is not an element separate from the material comparable to applicant's material which is incorporated in the "sheet-like matrix". Thus, applicant's "filter material comprising a sheet-like matrix" has "incorporated" therewithin,,

> a material comprising a base formed substantially of cellulous fibers onto which is adsorbed a composition comprising one or more aliphatic carboxylic acids having hydrocarbon chains consisting of 8 to 20 carbon atoms.

To briefly reiterate, the filter of the present invention comprises two components, namely (1) the matrix and (2) the

material which is incorporated within the matrix, whereas Wiegand only has a "mat-like structure".

Applicant's specification at page 3 states as follows concerning the matrix:

> The matrix of the first aspect of the invention may be fabricated from a number of materials, including non-woven fiberous materials, open-cell foam materials or a cotton or viscose gauze. The unloaded matrix advantageously has a density not greater than $0.25gcm^{-3}$, and preferably from 0.01 to $0.18gcm^{-3}$. A particularly preferred matrix has a thickness of around 3mm and a density in the region of $0.1gcm^{-3}$.

Again, neither Wiegand nor Holst provides the claimed structure which incorporates **both** (1) a "sheet-like matrix" and (2) "a material comprising a base from substantially of [surface modified] cellulous fibers" incorporated therewith. Why is this not acknowledged by the PTO?

Holst is directed to a method for absorbing oil, particularly hydrocarbon oils from the surface of water or from land. Like Wiegand, Holst carries out the desired absorbing function by depositing a material on top of the oil. The following text appears in the fourth paragraph on page 4 of the attached English language translation:

> The solution to the problem proceeds from the known method, in which the absorption of oil occurs using a small-particled, modified cellulous mass, but the method resulting in the solution of the problem according to the

> invention is characterized by the use of a small-particled cellulous mass which is modified using an organic isocyanate, a high molecular fatty acid, and ester of a high molecular fatty acid, a complex compound of a high molecular fatty acid with basic chromium chloride or a melamine resin precondensate having a high molecular fatty acid group.

What is meant by "a small-particled, modified cellulous mass" is suggested by reference to the prior art at the top of page 4 of the translation, i.e. "shredded newspaper or saw dust which [in the prior art] has been made hydrophobic, whereby organic silicon compounds, in particular, and also paraffin, fatty acid magnesium and fatty acid amines, are suggested as the hydrophobing agent." And in the very next paragraph, it is repeated that such materials are "powder particles".

In the fifth paragraph on page 4, the nature of this mass is made more explicit as follows:

> For example, milled or unmilled cellulous or cellophane, wood dust and milled or shredded paper, mainly newspaper and other old paper in the modified form, are used.

Also see the second paragraph on page 6 of the translation which refers to "scattered powder mass". **It should therefore be abundantly clear that Holst does not disclose a coherent body as claimed, namely a filter material comprising a sheet-matrix in which is incorporated a material comprising a base formed substantially of cellulous fibers.**

As regards the modifying agents of Holst, there appears to be five choices quoted above and repeated in the claim on page 13 of the translation. Functional advantages are mentioned with respect to the use of isocyanates, noting the paragraph spanning pages 4 and 5 of the translation. The last sentence of the first full paragraph on page 5 also mentions a functional advantage for the complex compounds with basic chromium chloride and the modified melamine precondensates. **No functional advantage is seen to be mentioned for high molecular weight fatty acids.**

Accordingly, if the person of ordinary skill in the art were to be led by the general disclosure of Holst to make a selection for a modifying material based on functional advantages, the first selection would be from among the isocyanate compounds, with second and third choices being from among the complex compounds with basic chromium chloride and the modified melamine precondensates.

Moving next to the eighteen examples of Holst, ten relate to isocyanates (examples 1-10), two relate to a chromium complex (examples 11 and 18), three relate to a melamine resin precondensate (examples 12, 16 and 17) and two relate to a fatty acid ester (examples 14 and 15) only.

Docosanoic acid also known as behenic acid. Its formula is $C_{22}H_{44}O_2$ (see attachments). It is not an aliphatic

carboxylic acid having a hydrocarbon chain consisting of 8-20 carbon atoms.

Comparative results are shown in the table at page 12. Such table shows that the results obtained in example 13 were not remarkable. The person of ordinary skill in the art, considering the teachings of the Holst examples, and considering the adoption of such teachings, would be much more inclined to select the teachings of example 3, or example 11, or example 18. The results disclosed by Holst thus teach away from the present invention by disclosing that the use of docosanoic acid as a modifying agent would give at best only average results.

As regards the proposed combination, it appears to be based on the mention in both citations of "paraffin". The rejection states at the middle of page 4:

> [Holst] further teaches ... that such a high molecular weight fatty acid is superior to conventional water proofing (sizing) agents such as paraffin. Accordingly, it would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute the higher molecular weight fatty acid treatment of the secondary reference for the paraffin treatment of the primary reference,....

Thus, as understood, the link between the two citations is the mention of paraffin in both documents.

As quoted above, paraffin is mentioned at page 4, line 3 of the attached translation as a material used to make

shredded newspaper or saw dust hydrophobic in the prior art. Applicant does not see in Holst any other mention of paraffin. Applicant does not see that paraffin is expressly mentioned[1] in Wiegand as a sizing material, and thus the stated nexus between the two documents therefore does not appear to exist. Accordingly, the proposed combination would not have been obvious to the person of ordinary skill in the art at the time the present invention was made.

As regards applicant's claiming of a "filter", applicant continues to rely on the case law cited in the Brief of February 27, 2003. Moreover, the rejection appears to be based on the **assumption** that the Wiegand material is **inherently capable** of acting as a filter, and is therefore a "filter", but there is no evidence in support of such an assumption. One cannot properly **assume** inherency. In other words, inherency must be reasonable certain or inevitable, and it is neither reasonably certain nor inevitable that the Wiegand material is a "inherently **capable** of being used as a filter" as stated at page 5 of the rejection.

Applicant respectfully notes that obviousness and inherency are two different things. Applicant believes that

[1] On page 8 of Appellant's Brief, it was pointed out that the sizing example in Wiegand comes from prior patent 2,754,206 and constitutes a mixture of paraffin wax, rosin, bentonite, and aluminum sulfate, not paraffin per se.

the examiner will agree that normally a rejection must be based on what a reference expressly shows rather than what it does not show, i.e. a rejection normally is not to be based on silence in a reference. *In re Burt et al*, 148 USPQ 548, 553 (CCPA 1966):

> Silence in a reference is hardly a proper substitute for an adequate disclosure of facts from which a conclusion of obviousness may justifiably follow.

The rejection based on §103 was reversed.

Attention is also respectfully invited to *In re Henderson*, 146 USPQ 372, 375 (CCPA 1965), where the court stated in part as follows:

> We are not impressed by the Board's view… that because the ether additives would "inherently function" to produce the decreased sensitivity, the claimed ethers are therefore obvious. …. The fact remains that appellant has *discovered* that when [one does what appellant has claimed, an improved result occurs.] The mere notion that such discovery would "flow naturally" from what *appellant* did does not mean that the discovery could be *predicted* from what the *art* had done. (Italics in original; bracketed material added)

Attention is also respectfully invited to *In re Spormann et al*, 150 USPQ 449, 452 (CCPA 1966), where the court stated in part as follows:

> The Board apparently thought that the minimizing of sulfate production would be *inherent* in the process of [the cited reference]. …. As we pointed out in *In re Adams*…, 148 USPQ 742, the inherency of an

> advantage and its obviousness are entirely different questions. That which may be inherent is not necessarily known. Obviousness cannot be predicated on what is unknown.

The rejection was reversed.

A particularly pertinent prior decision is that of *In re Shetty*, 195 USPQ 753, 756 (CCPA 1977), where the claims were directed to a method of curbing appetite in animals by administering certain adamantane compounds. The prior art taught the administration of various adamantyl compounds for other purposes. In agreeing with the decision below of the Board of Appeals, the solicitor argued:

> ... the compounds of claim 51 are obvious from and unpatentable over the corresponding Break compound and the Narayanan disclosure of a dosage which *corresponds* to appellant's disclosed appetite curbing dosage (therefore, *inherently* appetite curbing). [emphasis of the Court]

In reversing the rejection, the Court stated as follows:

> We cannot accept this conclusion. The issue here is whether the claimed method of curbing appetite would have been obvious. That appellant's "amount effective to curb appetite" corresponds to or inheres in Narayanan's amount "to combat microbial infestation" does not persuade us of the obviousness of appellant's method. (citation omitted; emphasis of the court).

The Court also noted and quoted from *In re Spormann, supra*, with reference *In re Adams, supra*.

It is true that in some rare cases rejections under §102 may be based on inherency. In those cases, the inherency

must be reasonably certain or inevitable. As stated in *In re Brink* 164 USPQ 247, 249:

> Absent a showing [by the PTO]of some reasonable certainty of inherency, the rejection... under 35 USC 102 must fail.

Also see *Ex parte Cyba*, 155 USPQ 756, 757 (1967); and *In re Oelrich* 212 USPQ 323, 326 (CCPA 1981).

The premise of the rejection is wrong. There is no **reasonable certainty** or **inevitability** that the structure of Wiegand is capable of being used as a filter. This is only an assumption which is not supported by any evidence.

The reasons for withdrawal of the rejection are many. Applicant's claims would not have been obvious from a consideration of the citations together. Applicant respectfully requests withdrawal of the rejection.

Favorable reconsideration and allowance are earnestly solicited.

Respectfully submitted,

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(54) Title: A Method for Absorbing Oil

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(72) Inventor: Holst, Arno, Dr.; Kostrzewa, Michael, Dr.; Lask, Helmut; 6200 Wiesbaden; Buchberger, Gerhard, 6201 Auringen

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K 2272 FP-Dr. P-df 24th November 1973

Specification
for the Application by

KALLE AKTIENGESELLSCHAFT
Wiesbaden-Biebrich

to patent

A Method for Absorbing Oil

The invention relates to a method for absorbing oil, particularly hydrocarbon oils in the broadest sense, such as crude oil, fuel oil, diesel oil and other motor fuels, from water surfaces, from water or from land.

The removal of oil from oil-polluted water surfaces, oil-polluted water or oil-polluted land is a particularly difficult task if the oil is to be absorbed almost completely. Since many cases involve large amounts of oil and thus make it necessary to use large amounts of absorbing means, the absorbing means, if possible, should also be relatively cheap.

Many means have already been suggested for absorbing oil, particularly oil which is floating on water surfaces. The means which have been suggested most frequently are those which consist mainly of mineral or other inorganic powders which, if necessary, have been made superficially hydrophobic; they only absorb relatively small amounts of oil and furthermore have the disadvantage that they sooner or later sink with the absorbed oil through the water down to the bottom where the oil is then a latent threat of a new contamination of the water surface because it is not probable that it will remain

adsorbed in the inorganic adsorbent forever. Other suggestions relate to the use of shredded newspaper or sawdust which has been made hydrophobic, whereby organic silicon compounds, in particular, and also paraffin, fatty acid magnesium and fatty acid amines, are suggested as the hydrophobing agent.

These known oil-absorbing means do not retain the oil adequately, which results in part of the oil being re-released after the oil-filled absorbing means has been in water for some time, particularly in moving water. It is also difficult to collect the oil-filled newspaper or the sawdust from the water surface because the powder particles only agglomerate slightly.

The task of the present invention is to provide a method of absorbing oil from oil-polluted water surfaces, oil-polluted water or oil-polluted land, in which the oil is almost completely absorbed from the water surface or from land, and in which the absorbing means retains the oil for a long time and can be easily collected from the water surface.

The solution to the problem proceeds from the known method, in which the absorption of oil occurs using a small-particled, modified cellulose mass, but the method resulting in the solution of the problem according to the invention is characterised by the use of a small-particled cellulose mass which is modified using an organic isocyanate, a high molecular fatty acid, an ester of a high molecular fatty acid, a complex compound of a high molecular fatty acid with basic chromium chloride or a melamine resin precondensate having a high molecular fatty acid group.

For example, milled or unmilled cellulose or cellophane, wood dust and milled or shredded paper, mainly newspaper and other old paper in the modified form, are used.

The organic isocyanates are preferably bivalent isocyanates or multivalent

isocyanates. The cellulose masses converted using isocyanates are characterised in that they are quickest in completely absorbing the oil from water surfaces or from land. The use of isocyanate-converted cellulose masses also has the advantage that in many cases these can also be converted in water using the isocyanates, which means that it is not necessary to use an organic solvent as a reactant. This applies, for example, to isocyanate compounds, which are generated by condensing three molecules of a diisocyanate, for example by condensing three molecules of hexamethylene diisocyanate, and to stearyl isocyanate.

High molecular fatty acids, their esters, their complex compounds with basic chromium chloride and melamine resin precondensates substituted therewith are fatty acids with at least 14 carbon atoms in the molecule. The use of the fatty acids and the indicated derivatives, which are manufactured with them, has the advantage that comparatively small amounts of the fatty acid compounds are needed to modify the cellulose masses. The complex compounds with basic chromium chloride and the melamine precondensates which are modified using fatty acid result in modified cellulose masses which have comparatively high oil-absorbing properties.

The method according to the invention results in effective oil absorption and in oil-loaded masses, which clump together in solid agglomerates, can float and can thus be easily collected by simple means without leaving behind any residue. In addition, part of the oil-absorbing modified cellulose masses is completely biodegradable and, in addition, these, themselves, can therefore promote fast biodegradation of oil residues, including those located at locations which are difficult to access. A further advantage is the fact that the oil-absorbing modified cellulose masses used in the method can be manufactured comparatively easily, and thus cheaply.

The method according to the invention makes it possible to firmly bind the oil to

the oil-absorbing mass when removing oil from oil-polluted water surfaces. The method can also be advantageously used in cases of oil accidents on land. Depending on the agglomerating properties of oil-filled cellulose masses, oil can also be absorbed from earth effectively. The method can also be used to remove oil from oil-polluted water as it runs through a container in which the oil-absorbing modified cellulose mass is located, whereby the mass acts as a purifying mass.

The following examples further illustrate the method according to the invention. The manufacture of the oil-absorbing modified cellulose mass, which is to be used in the method, is described in the examples. The oil absorbency of the manufactured product was determined subsequently in each of the examples below. To this end, 100g of water was poured each time into a 250ml beaker and 2g of oil (which was a used oil drained from a vehicle) was poured thereon. Small portions were then taken from a weighed amount of the manufactured oil-absorbing cellulose mass and scattered onto the oil-polluted water surface while it was being stirred with a glass rod until all of the oil was absorbed by the scattered powder mass, i.e. until an oil film could no longer be seen on the water, and until the agglomerates of oil and the oil-adsorbing mass were agglomerated to a sufficient extent to enable them to be lifted out of the water using the glass rod. The used amount of oil-absorbing mass was determined and the absorbed amount of oil per gram of mass was calculated. These amounts are listed in the table following the examples.

Example 1

While being subjected to continuous kneading, 17g of milled newspaper (particle size under 0.5mm) is moistened with 50ml of isopropanol (100%), is heated to 80°C, 5g of diphenylmethane-4,4'-diisocyanate, which is dissolved in 20ml isopropanol, being added drop by drop thereto and is kneaded for a further 60 minutes at 80°C in a closed kneading device. The obtained product is

dried at 60°C.

Example 2

As in example 1 above, 17g of milled cellulose (particle size under 0.25mm) is converted using 5g of diphenylmethane-4-4'-diisocyanate which is dissolved in 20ml isopropanol and the obtained product is dried.

Example 3

While being mixed thoroughly, 17g of milled cellulose (particle size under 0.25mm) is sprayed at room temperature with a solution of 17g of a triisocyanate, which is manufactured by condensing 3 molecules of hexamethylene diisocyanate, in 20ml of xylene and is left for 30 minutes to react in the drying chamber at 120°C.

Example 4

17g of milled cellulose (particle size under 0.25mm) is sprayed at room temperature with 17g of water and, as in Example 3 above, is then converted, using 17g of triisocyanate dissolved in xylene.

Example 5

While being kneaded continuously, 17g of milled cellulose (particle size under 0.025mm) is moistened, in a kneading device (Drais kneader), with 50ml of xylene, heated to 80°C, sprayed with a solution of 17g of the triisocyanate in 20ml of xylene mentioned in Example 3 above and kneaded for a further 60 minutes at 80°C.

Example 6

17g of milled newspaper (particle size under 0.5mm) is moistened with 50ml of xylene as in Example 5, sprayed with a solution of 17g triisocyanate (as in Example 3 above) and kneaded for a further 60 minutes at 80°C.

Example 7

17g of wet-milled unlacquered cellophane is moistened with 50ml of benzine in a toothed-disc mill (the space beneath the teeth being 3 to 5mm) while being kneaded in a kneading machine and, while kneading continues, is sprayed at room temperature with 17g of diphenylmethane-4,4'-diisocyanate dissolved in 20ml benzine. After a further 15 minutes of kneading, the product is dried for 15 hours at 100°C.

The product obtained is very suitable for purifying water, which is polluted with a small amount of oil, i.e. less than 1% oil, in a continuous process.

Example 8

As in Example 7 above, 17g of wet-milled unlacquered cellophane is moistened with benzine and is sprayed at room temperature with 17g of the triisocyanate mentioned in Example 3 above which is dissolved in 20ml of benzine. It is kneaded for a further 15 minutes and then dried for 15 hours at 100°C.

Example 9

While it is being kneaded in a kneading device, 20g of milled cellulose (particle size below 0.25mm) has 1g of distilled water, 1g of triethylamine and 100ml benzol added thereto, is heated to 80°C, has 10g of stearyl isocyanate, which is dissolved in 20ml of benzine, added drop-by-drop thereto and is left to react for

60 minutes at 80°C. The obtained product is sucked off, washed with benzol and dried at 60°C.

Example 10

While it is being kneaded in a kneading device, 20g of milled cellulose (maximum particle size 0.25mm) has 1g of distilled water, 1g of triethylamine, 100ml of benzol and 10g of stearyl isocyanate, which is dissolved in 20ml of benzine added thereto, is then heated to 80°C and is kneaded at this temperature for 60 minutes. The obtained product is filtered off, washed with benzol and dried at 60°C.

Example 11

While it is being kneaded in a kneading device, 100g of cellulose (particle size below 0.5mm), which is mixed with 300g of 1wt.% NaOH, is treated with 10g of a 30wt.% solution of a chromium myristic acid complex for 1 hour at 70°C. The excess alkali is then neutralised using glacial acetic acid and then dried in a drying chamber at 70°C. The chromium myristic acid complex corresponds to the composition $C_{13}H_{27}COOCrCl_2 \cdot Cr(OH)Cl_2$. It is dissolved in a mixture of isopropanol, actone and water (60:30:10 parts by weight).

Example 12

While mixing thoroughly, 20g of cellulose (particle size below 0.5mm) is dispersed in 150ml of isopropanol (100%), which contains 1g of a trimethylol melamine substituted with stearic acid, at 70°C and and is then stirred for a further 30 minutes at 80°C. The mixture is then dried in the drying chamber at 100°C.

Example 13

A solution of docosanoic acid in 100ml of toluene is added in a kneading device to 20g of cellulose (particle size below 0.5mm) which is treated therewith while being kneaded at 80°C. The solvent is then removed by drying at 120°C.

Example 14

A solution of 2g of pentaerythritol tetrastearate in 100ml of toluene is added in a kneading device to 20g of cellulose (particle size below 0.5mm) which is treated therewith during kneading for 30 minutes at 80°C. It is then dried at 120°C.

Example 15

20g of cellulose (particle size below 0.25mm) is treated with a solution of 2g pentaerythritol tetrastearate in 100ml of toluene for 30 minutes at 80°C while being kneaded in a kneading device. It is then dried at 120°C.

Example 16

Unlacquered cellophane is ground on a toothed-disc mill into particles with a particle size of approximately 5mm, a suspension containing 7.5g of a triethylol melamine, substituted with stearic acid, suspended in 450ml of isopropanol (100%), is added to 150g of the ground cellophane which is allowed to react for 1 hour at 80°C while being kneaded in a kneading device. It is then dried at 100°C.

Example 17

200g of coarse sawdust is mixed homogenously with 600ml of isopropanol (100%) and 40g of a dispersion of 20g molten trimethylol melamine modified

with stearic acid in 2g of glacial acetic acid and 58g of water at 70°C while being kneaded in a kneading device. A warm solution of 2g of aluminium sulphate in 5g of water is then added. The mixture reacts for 1 hour at 70°C while still being kneaded. It is then dried at 120°C in the drying chamber.

Example 18

While being kneaded in a kneading device, 100g of finely-milled newspaper (particle size below 0.25mm), which is mixed with 300g of isopropanol (100%), is treated with 25g of a 30wt.% solution of a chromium myristic acid complex (cf. Example 11 above) for 1 hour at 70°C. The solvent is then removed by drying.

Table

Adsorbed amounts of oil in grams per gram of modified cellulose mass

Ex. no.	Amount of oil	Ex. no.	Amount of oil	Ex. no.	Amount of oil
1	6.5 - 7	7	4	13	8
2	4	8	5	14	10
3	20	9	7	15	7
4	10	10	8	16	10
5	4	11	17	17	5
6	4	12	10	18	20

Claim

A method for absorbing oil from oil-polluted water surfaces, oil-polluted water or oil-polluted land using a small-particled, modified cellulose mass, characterised by the use of a small-particled cellulose mass which is modified using an organic isocyanate, a high molecular fatty acid, an ester of a high molecular fatty acid, a complex compound of a high molecular fatty acid with basic chromium chloride or a melamine resin precondensate having a high molecular fatty acid group.

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$C_{22:0}$ Behenic acid (Docosanoic)

CAS number	112-85-6
molecular formula	$C_{22}H_{44}O_2$
molecular weight	340.60
Melting point °C	79.9/80.0
Boiling point °C (mm Hg)	306 (60)
Density D_4^t (°C)	0.8221 (100)
Viscosity mPa·s (°C)	N/A
Refractive Index n_D^t (°C)	1.4270 (100)
Specific Heat J/g (°C)	2.03 (18-71)

Safety (MSDS) data for behenic acid

General

Synonyms: docosanoic acid
Molecular formula: $C_{22}H_{44}O_2$
CAS No: 112-85-6
EINECS No: 204-010-8

Physical data

Appearance: white to cream crystals or powder
Melting point: 74 - 78 C
Boiling point:
Vapour density:
Vapour pressure:
Density (g cm^{-3}):
Flash point:
Explosion limits:
Autoignition temperature:
Water solubility: insoluble

Stability

Stable. Combustible. Incompatible with bases, oxidizing agents, reducing agents.

Toxicology

Avoid breathing dust. Eye, skin and respiratory irritant. Toxicology not fully investigated.

Risk phrases
(The meaning of any risk phrases which appear in this section is given here.)
R36 R37 R38.

Transport information

Non-hazardous for road, sea and air freight.

Personal protection

Minimize contact.

Safety phrases
(The meaning of any safety phrases which appear in this section is given here.)
S22 S24 S25 S26 S36.

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